Using Archived ITS Data to Improve Transit Operations

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ITS at TriMet

- Computer Aided Dispatch (GPS Based AVL)
- Transit Signal Priority (City of Portland)
- Real Time Customer Information
  - On Street Transit Tracker
  - Web Transit Tracker
- Automatic Stop Announcement
- Automatic Passenger Counters (Bus and Rail)

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TriMet AVL/APC Data

Bus Stop data - on-board computer collects comprehensive information at each stop

- 100% of fleet AVL – 75% of fleet APC
- 500K daily stop records
- 100 million stop records on-line (9 months)
- Primary uses- performance monitoring & analysis

Rail AVL/APC Data – Loop Detection & APCs

- 106 LRT vehicles – 29 have APCs (27%)

Block: 1402   **Date: Friday, March 07, 2008**

Route	Dir.	Trip No.	Badge	Vehicle No.	Loc ID	Bus Stop	Sched. Time	Arrive Time	Leave Time	Minutes Late
14	0	1840	2007	02616	7098	**SW 2nd & Taylor**	7:05 PM	7:12:18 PM	7:13:34 PM	08:34
14	0	1840	2007	02616	7095	SW 2nd & Alder	7:05 PM	7:14:06 PM	7:15:40 PM	
14	0	1840	2007	02616	4028	Morrison Bridge	7:08 PM	7:16:30 PM	7:16:50 PM	
14	0	1840	2007	02616	463	SE Belmont & 7th	7:10 PM	7:18:02 PM	7:19:10 PM	
14	0	1840	2007	02616	2597	SE Hawthorne & 9th	7:12 PM	7:20:34 PM	7:20:54 PM	
14	0	1840	2007	02616	2599	**SE Hawthorne & 12th**	7:13 PM	7:21:14 PM	7:21:48 PM	08:48
14	0	1840	2007	02616	2595	SE Hawthorne & Maple	7:13 PM	7:21:58 PM	7:22:04 PM	
14	0	1840	2007	02616	2603	SE Hawthorne & 16th	7:14 PM	7:22:14 PM	7:22:46 PM	
14	0	1840	2007	02616	2596	SE Hawthorne & Poplar	7:14 PM	7:22:56 PM	7:23:26 PM	

Ons	Offs	Load	Dwell Time	Door	Lift	Max Speed
12	0	31	51	2	0	16
19	10	40	67	2	0	21
0	1	39	9	1	0	38
4	3	40	39	3	0	32
0	0	40	5	2	0	32
4	2	42	21	2	0	24
0	0	42	0	0	0	29
1	3	40	14	2	0	35
0	6	34	16	2	0	24

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Real Time vs. Archived Data

"Preventing the incident from happening in the first place"

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# Archived ITS Data to Improve Transit Operations

Three Step Approach

- Service Planning
- Scheduling
- Field Operations/Operators

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Service Planning

- Ridership reporting
- Load/capacity analysis
- New performance measures
- Revised standards

Peak Hour Load to Headway Deviation
Line 14 Hawthorne Inbound
Peak Hour (7:58 am - 8:57 am)

y = 3.2x + 48.4
$R^2 = 0.31$

Overloads

Underloads

Maximum Load

Headway Deviation (Minutes)
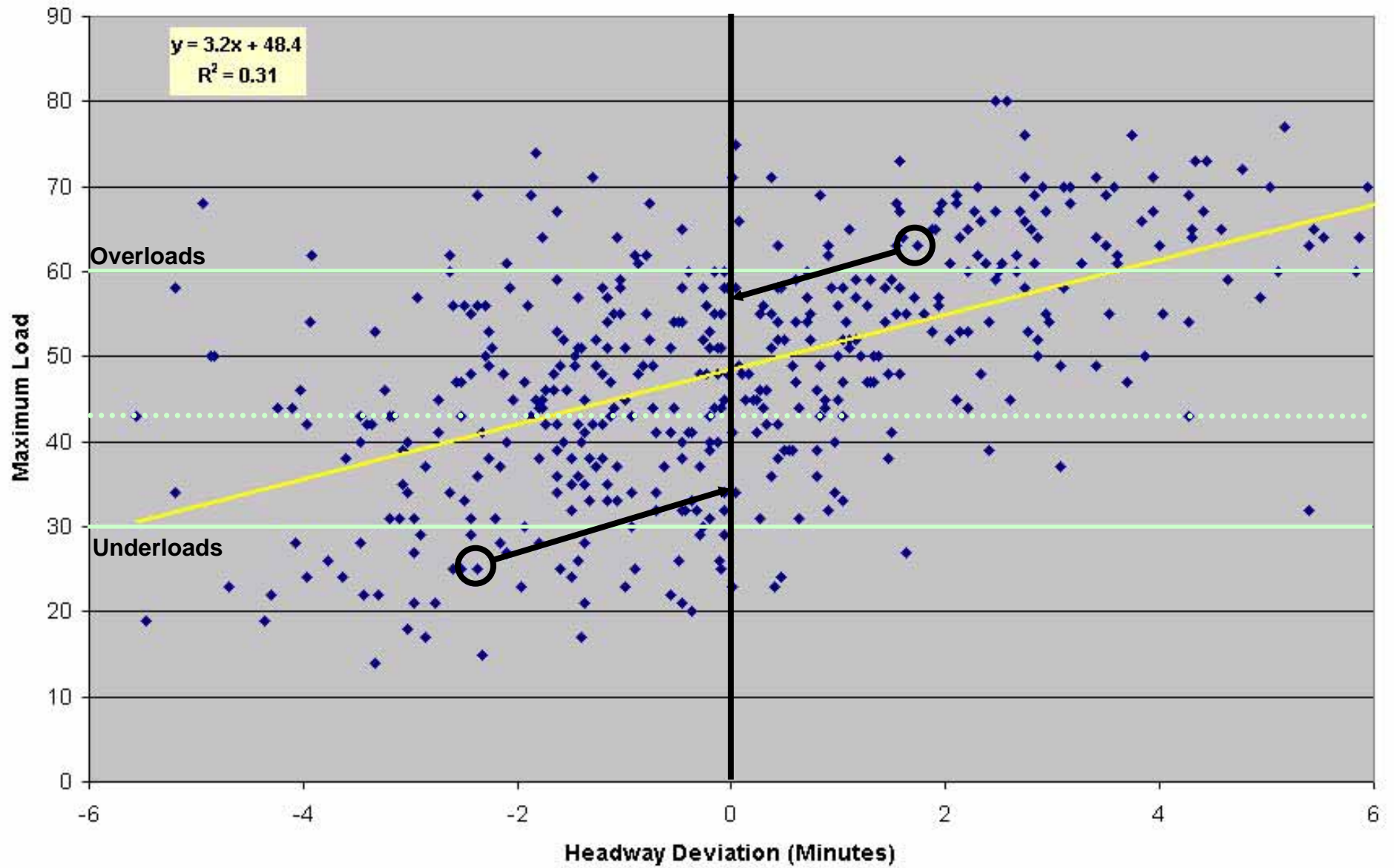
Scheduling

- Provide best schedules possible
- Running times
  - Various reports
  - Applications

Run Time Graph

057 - TV Hwy / Forest Grove

Weekday

Outbound to Forest Grove

Hillsboro Central TC - Adair & 14th \Cornelius

Legend: 20th %ile, 50th %ile, 80th %ile, Schedule

Minutes (y-axis: 6, 8, 10, 12, 14, 16, 18)

x-axis times: 5:14 AM, 5:34 AM, 6:30 AM, 7:01 AM, 7:32 AM, 8:02 AM, 8:32 AM, 9:02 AM, 9:32 AM, 10:02 AM, 10:32 AM, 11:02 AM, 11:32 AM, 12:02 PM, 12:32 PM, 1:02 PM, 1:32 PM, 2:02 PM, 2:32 PM, 3:02 PM, 3:32 PM, 4:02 PM, 4:32 PM, 5:02 PM, 5:32 PM, 6:02 PM, 6:32 PM, 7:32 PM, 8:32 PM, 9:32 PM, 10:32 PM, 11:32 PM, 1:05:00 AM

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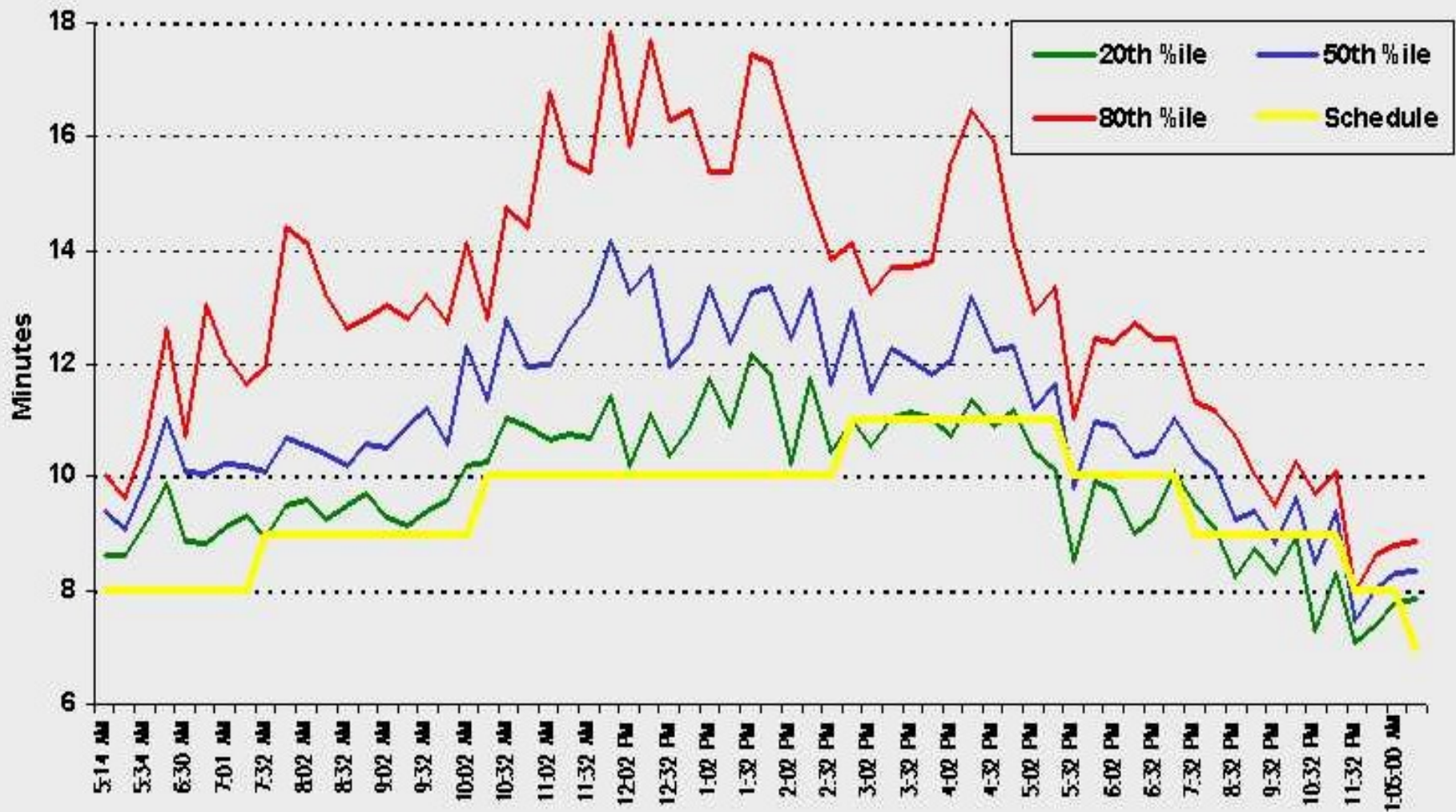
Field Operations/Operators

Operator specific reports

- Running early
- Leaving late
- Operator driving characteristics
  - Research
  - Training
  - Driving slow/fast

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Operators Leaving Time Points 1 Minute Early at least 15% of the Time
Center Garage

Badge	Operator Name	Duty	Seniority	February 3 to 16, 2008	Percent			Number of Months Early within Last Year
				Avg. Min. Early	Early	On Time	Late	
2485	Dodd, Florence	Full Time	Regular Operator	2:33	47%	51%	2%	8
687	Noakes, Gordon	Full Time	Regular Operator	2:09	44%	56%	0%	12
2377	Posner, Geoffrey	Full Time	Regular Operator	2:16	40%	59%	2%	10
2704	Smith, Pete	Full Time	Regular Operator	1:55	36%	64%	0%	8
245	Forrest, John	Full Time	Regular Operator	2:09	35%	61%	4%	12
6166	Bell, Kevin	Full Time	Regular Operator	2:28	33%	64%	2%	9
2582	Patrick-Rose, Maureen	Full Time	Regular Operator	2:20	32%	62%	6%	10
1652	Njoroge, Kihunyu	Full Time	Regular Operator	2:08	28%	71%	1%	12
3928	Poetter, Lorna	Full Time	Vacation Relief	2:44	28%	61%	11%	9
656	Dist, William	Mini Run	Regular Operator	2:45	25%	66%	8%	11
3935	Orlando, Criston	Full Time	Vacation Relief	3:03	25%	60%	15%	3

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Operators Running Early by Location - Center Garage
Badge 687: Noakes, Gordon

Block	Route	Time Point Location	Direction	Sched. Time	% Early	Min. Early*	Days Operator Works
span: February 3 to 16, 2008							
3305	133	N Interstate & Rose Quarter TC	Out	6:50 AM	100%	2:17	MTWHF
3305	133	N Stanton & Vancouver	Out	6:56 AM	90%	1:59	MTWHF
3305	133	NE Fremont & 15th	Out	7:03 AM	100%	2:30	MTWHF
3305	133	NE Fremont & 33rd	Out	7:07 AM	100%	3:09	MTWHF
3305	133	NE Fremont & 57th	Out	7:11 AM	100%	3:09	MTWHF
3305	133	NE Fremont & 82nd	Out	7:16 AM	100%	2:19	MTWHF
3305	133	Gateway Transit Center	In	7:52 AM	100%	3:19	MTWHF
3305	133	NE Fremont & 82nd	In	8:03 AM	100%	2:40	MTWHF

Lessons Learned

- Integrated ITS system
- Large IT & scheduling technician staff
  - Developed "in house" programs & tools
  - Adapted data to our environment
- Flexible and worked with vendors
- Enterprise database - integration

- Research possibilities
- Looking for new ways to use data